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ABSTRACT

Produced by the Agency for International Development, this magazine presents articles and speeches on international development. Published monthly, the articles focus on developing nations and problems and areas of development. Typical issues offer articles on food and nutrition, education, disaster and humanitarian relief, U.S. government policy, voluntary and private agencies, health and sanitation, population and family planning, research, science, technology, and environment. This sample issue discusses educational development in disadvantaged nations. Articles include: education in developing countries, population programs, new hope in the battle against malnutrition, and agricultural development. The periodical is available without cost to persons who request to be placed on the mailing list. (JR)

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War on Hunger

A Report from The Agency for International Development

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DECEMBER 1975

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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War on Hunger

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COVER: School enro ment has increased most developing countri even though the numb of persons who have n received any educati at all also has grow AID is helping to broad the reach of educati programs, while assisti the effort to surmou the forces that fost illiteracy.

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The article beginning on page 1 is adapted from the section on education in AID's Fiscal Year 1976 Presentation to Congress.

This article is available in pamphlet form; write Publicatio Division, Office of Public Affairs, AID, Washington, D.C. 2052

PRIORITY Education

Increasing educational opportunities for women in developing countries is an AID priority.

Education is one of the largest single items of public expenditure in many of the developing countries, but too few of the people living in these countries have been able to contribute to or share in the development process. They lack the information, practical knowledge, and skills necessary for full participation in society.

- More than half of the population in most developing countries have never been to school.
- Illiteracy in some countries of Asia, Africa, Latin America, and the Middle East is actually increasing because school enrollment cannot keep pace with high population growth.
- Even where schooling is available, the conditions and quality of learning are so poor that up to 50 percent of the children enrolled in school fail to complete their third year.

Major impediments to progress in the field of education include:

- lack of school facilities and materials;
- poorly trained and underpaid teachers who often resist serving in village schools and do a poor job when forced to remain in such positions;
- overcrowded classrooms;
- inefficient systems, which raise the cost of learning, and outdated curricula.

AID seeks to help developing countries:

—make practical and relevant learning opportunities available to a greater number of people at lower cost;
—develop innovative and imaginative nonformal educational techniques to equip the poor majority with the knowledge and skills necessary for effective participation in their societies;
—increase their emphasis on the education and training needs of women to enhance their role in development.

U.S. foreign assistance helps to develop more useful and precise methods to:

- —identify the learners—both children and adults—and what they need to learn to contend with their life problems;
- —insure that assistance projects focus on the learning needs of these populations.

Education assistance is now focused increasingly on the poor majority, addressing a broad spectrum of needs and problems, through effective use of existing formal and nonformal educational resources.

- The regionally sponsored Project IMPACT in the *Philippines* and in *Indonesia* combines professional analysis and advice with intense involvement of rural populations in the educational process as part of integrated rural development programs.
- *Peru and Bolivia* are focusing resources on leadership and management capability for rural development to broaden the extent of existing successful adult education programs.

An immediate need in many developing countries is the construction of new schools in rural areas. AID is supporting school building projects in:

- —*Nicaragua*, where CARE will provide modern equipment and trained workers for carpentry shops which in turn will supply school furniture for use in rural primary schools being constructed by a CARE program.
- —*Afghanistan*, with financing for construction of new village schools with attached housing for the teachers.

Curriculum Reform

Educational opportunities must be more broadly available and the content of the curricula must be revised to meet the needs of learners. Curriculum reform is thus an important part of AID's educational assistance program. For example:

- In *Guatemala*, an AID loan is helping develop a rural curriculum appropriate to both Spanish-speaking and non-Spanish-speaking children from Indian and mixed ethnic backgrounds.
- AID advisors in *Swaziland* will help the government carry out a curriculum reform program stressing general rural life skills in primary education. Subject areas include agricultural methods, health and nutrition, and simple business arithmetic.
- The Government of *Afghanistan*, assisted by AID, undertook a total reform of the primary school curriculum six years ago. This involved rewriting traditional texts and writing new texts on subjects such as public health and agriculture. By 1980, as many as 800,000 Afghan children will be using complete sets of new textbooks more relevant to rural life.

School construction is an immediate need in many rural areas of less developed countries.

Searching for new ways to provide learning opportunities for large numbers of people, AID supports efforts to develop more effective use of educational technology, which often includes the use of media such as radio, television, film, and computers for instruction. AID has encouraged the development of the "systems approach"—introduction of new instructional delivery systems combined with changes in textbooks, teaching methods, curricula, and classroom organization.

- In *El Salvador*, an AID-sponsored experimental project used television instruction at the seventh grade level in 32 pilot schools. It now reaches all 60,000 secondary school students and

is being extended into the fourth and fifth grades of primary school. It also is being used for nonformal, adult education. Traditional rote teaching has been rapidly replaced through television lessons incorporating demonstrations, dramatic presentations, and exciting teaching.

- In *Latin America*, the Children's Television Workshop—producers of "Sesame Street" and "The Electric Company"—will produce a pilot episode of a Spanish-language version of "The Electric Company" in cooperation with Latin American educators and reading specialists. More than 70 million youngsters and adults in Latin America who are illiterate or who experience reading difficulties make up a vast potential audience.

The high cost of systems using television has led to increased emphasis on radio, which had been neglected for some time. Radio is less expensive than television, more widely available, easier to use, and more flexible. Using radio in the rural areas of many developing countries helps families that otherwise would not be reached.

- In *Guatemala*, educational radio, self-teaching groups, and pictorial texts are part of an AID-funded experimental program providing practical instruction about improved farming methods to large numbers of illiterate subsistence farmers. Encouraging results have led the Guatemalan Government to expand the content of the program and to extend it over a wider area.
- In rural *Paraguay*, radio instruction combined with printed workbooks will be aimed at the slow learner, the semi-literate dropout, and schools which do not offer all six years of elementary grades.
- In *Pakistan*, AID will help develop systems using radio and other low-cost media to support rural development activities in agriculture, health, family planning, and the extension of primary schooling, with special emphasis on the needs of rural areas and women.
- *Nepal* is receiving AID help in developing radio and other low-cost media programs to reach geographically-isolated rural primary school teachers with practical training.

Greater emphasis is being given to training specialists in food production within their own countries.

Professional Development

Since 1941, approximately 175,000 foreign nationals have received training under the foreign assistance program. About 10,000 foreign nationals are in training (academic, observation, on-the-job, or specialized) each year.

Costs of the foreign assistance training program are shared with the developing countries. Almost all international travel expenses for participants are paid by the participant's country, and many developing countries also continue salary payments to the participant during the training period.

Participants in the training program must agree to return to their home countries. Many former participants occupy positions of authority and responsibility in their countries.

A large number of developing countries still lack college level managerial and technical manpower to accelerate development through government or private sector service. The problem is particular-

ly severe in *Africa*, where the proportion of educated and technical personnel to general population is only one-third that of Asia.

- A new AID program proposed for FY 1976 will focus on current critical manpower needs in *Africa*. The program will provide undergraduate training in selected fields for students from countries whose own educational institutions do not have the capacity to meet domestic needs. Graduate level programs at African and U.S. institutions will focus on agricultural research and production, public health, nutrition, rural education, administration of specialized programs, and special manpower training courses in the area of rural development.
- AID will finance specialized training in the United States and other nations for participants from:

—*Rwanda:* AID will provide $100,000 for training Rwandans in short-term specialized courses in the United States, African countries, or United Nations-sponsored programs abroad.

—*Botswana, Lesotho, Malawi, Swaziland,* and *Zambia:* all have suffered from a lack of preparation in the area of professional, technical, and managerial training. AID will fund training for about 100 participants over a five-year period at *African* institutions, wherever possible.

—*Philippines:* training of Filipinos in economic planning, project evaluation, and program management will help insure that the government can take over and successfully implement projects started with AID assistance.

AID also supports training programs in the countries themselves, by sending advisors and supplies and financing the costs of educating local people. Examples:

- In *Nepal*, the government expects to contract with a U.S. university to conduct a management training course for Nepalese trainers in Nepal.
- In *Niger*, an AID-financed training project will develop and conduct a series of short-term courses in development management, using African instructors with practical experience to teach the courses.

Although AID continues to finance the overseas training of individuals from developing nations, the ultimate goal is for each nation to be able to educate sufficient personnel in local institutions. AID support of higher education in *Africa, Asia,* and *Latin America* aims toward this goal:

- In *Tunisia,* AID is assisting the government in developing an independent Tunisian Graduate School of Business Administration. Eight staff members now teaching at the school completed their graduate training in the United States.
- In *Malawi,* AID is financing construction of additional facilities, staff instructors, and university-level training to qualify local individuals for the teaching staff of Bunda Agricultural College.
- In *Afghanistan,* U.S. assistance will make it possible to introduce new courses at Kabul University in power engineering, agricultural mechanics, food processing, vocational teacher training, engineering management, and applied research.
- In *Lebanon,* AID has been financing scholarships for students from Asian countries at the American University of Beirut for 25 years. At first most of the students were secondary school graduates who needed college-level training. Now, most of the 485 AID-financed students are middle-level government and private sector technicians who have completed university training in their own countries and are working on master's degrees in agriculture, engineering and public and business administration.
- In *Africa,* AID is helping the Association of African Universities expand its program of scholarships for Africans to about 800 students.
- The Latin American Teaching Fellows Program of Tufts University, with support from AID, sends experts at the post-doctoral level in science and technology to universities and governments in *Latin America.*

Under the United Nations Fellows program, AID also proposes to underwrite ($1.3 million in FY 1976) specialized and on-the-job training for 700-800 participants from developing nations through Federal agencies, such as the Departments of Agriculture, Labor, Commerce, Interior, and Transportation.

Population Programs—How Good?

Are family planning programs showing any results?

Five distinguished medical and academic leaders in the population field testified before the House Appropriations Subcommittee on Foreign Operations November 13 that the AID-supported population efforts are effective.

More effort and resources are needed, the experts agreed, to extend family planning services and supplies to the rural areas. Research to find out why programs are more effective in some countries than others would also be helpful. Dr. Henry Mosley (M.D.), Chairman of the Department of Population Dynamics, School of Hygiene and Public Health, The Johns Hopkins University, specifically endorsed the new emphasis on development assistance programs to reach the poorest sector in rural areas.*

Excerpts from Dr. Mosley's statement follow:

Three major considerations should be emphasized:

1. Present population growth rates in the developing countries must be reduced rapidly or else other development efforts in such fields as agriculture, nutrition, health, education and the like will simply not be able to achieve their objectives.

2. Programs to reduce fertility will have to reach more vigorously and effectively into the rural areas where 80 percent of the population of developing countries live.

3. Programs to reduce fertility will have to link family planning services, reliable contraceptive supply lines, educational programs, rural development, improved status for women, employment opportunities, and a whole range of community activities in order to have a continuing strong impact on developing country populations.

The magnitude of the effort required to deliver services to reproducing women becomes clear when it is recognized that the 438 million women in the reproductive ages in 1975 will have essentially left the age group by year 2000 to be largely replaced by a new group of women now double in size. Therefore, in fact, in the next 25 years services must actually be delivered to well over one billion women in these specific developing countries.

The major weakness of governmental family plan-

(Continued on p. 14)

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* *The other four who testified included:*

Dr. Conrad Taeuber, Director of the Population Center of Georgetown University; Professor George Simmons, Department of Population Planning, School of Public Health, University of Michigan; Dr. Elizabeth Connell (M.D.), Associate Director for Health Sciences, Rockefeller Foundation, and Professor Joseph Stycos, Director, International Population Program, Cornell University. Subcommittee members present were Clarence Long (D-Md.), Silvio Conte (R-Mass.), Edward Koch (D-N.Y.), and Joseph Early (D-Mass.).

Pakistan is engaged in an intensive campaign to make family planning services more accessible to its burgeoning population. A main effort is being made to inform women in the rural areas. Advice and contraceptives are available.

The Research Link-Up

By Guy Baird

The world food crisis poses a question of balance. Can world food production increase at a rate that will at the very least equal the rate of population growth?

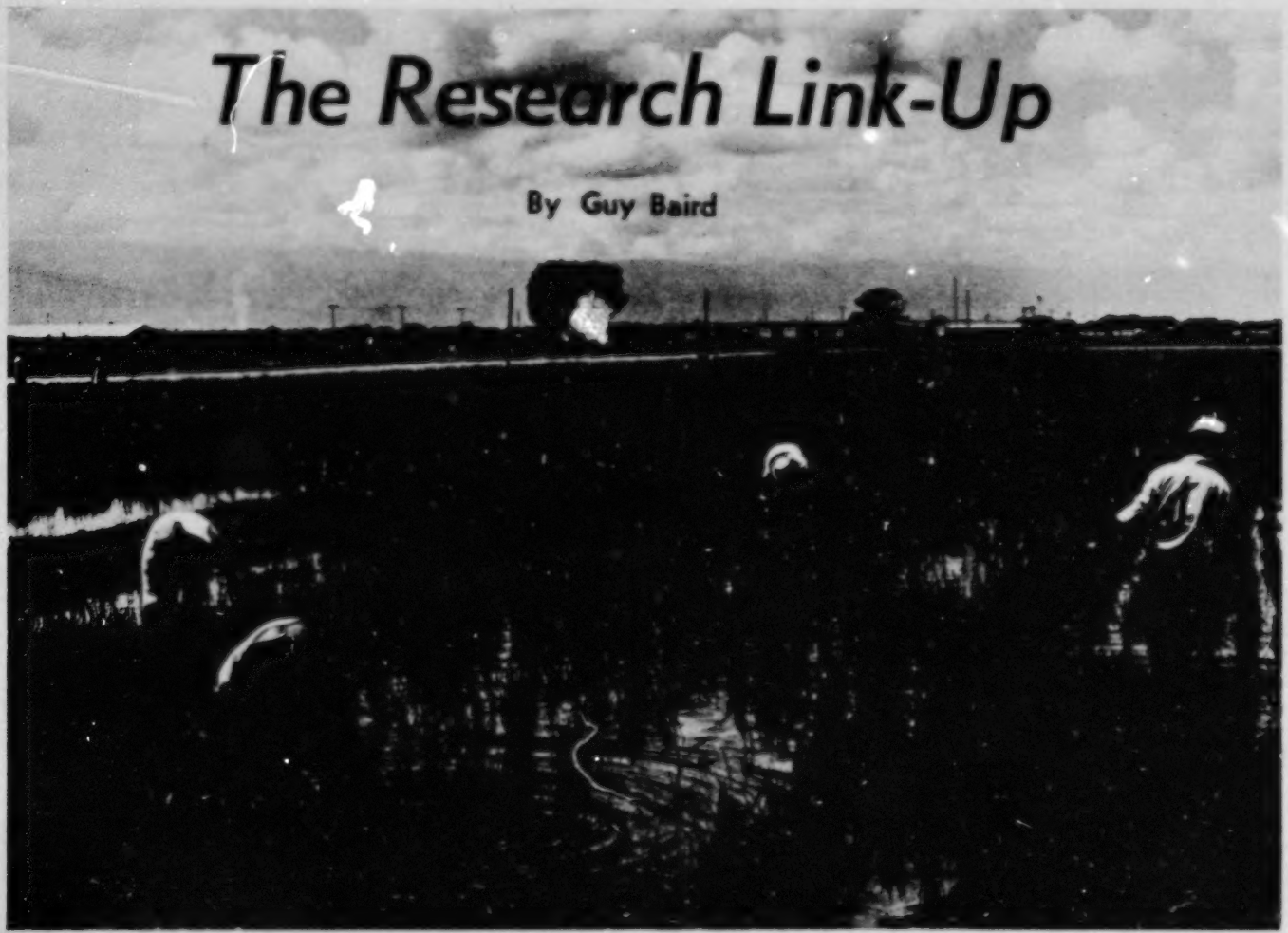
A look at the past 20 years indicates that such a balance has indeed been possible. Total food supplies increased at a faster rate than total population. Despite this overall balance, however, famine and chronic malnutrition have characterized the lives of millions in the less developed countries who could not produce enough food for themselves or could not afford to bid for it in a market shared with much wealthier world neighbors.

While inadequate food distribution systems and income inequality continue as major international and development problems, the future challenges mankind even more fundamentally. For much of the increase in food production over the past two decades has occurred within a handful of developed countries which presently produce food surpluses sufficient to cover most of the deficits of other nations. But these food exporting countries are fast approaching the limits of their capacity to increase production without substantially increased costs. The margin for economically realistic growth has narrowed because of a scarcity of land, water, and the other necessary resources.

Yet, to avoid widespread disaster, food production must keep pace with population growth, and within 35 years the world population will double.

Future increases in food production to meet the needs of the less developed countries clearly will have to be achieved largely within those countries. They have great potential for expanding the output of their agricultural sector and they have the most pressing need to do so. Fortunately, many still possess large amounts of unused or underutilized land and water for agriculture and thus there is the opportunity that food shortages can be met. But to make the advances in agriculture which they must, the farmers of the developing countries will need assistance.

Dr. Baird is Associate Director for Research in AID's Office of Agriculture. His article presents an overview of international research activities, which will be the subject of a War on Hunger *series during 1976.*



Food production must keep pace with population growth. Developing countries have the most need to increase production and they have great potential for it. Research will be a key factor in helping small farmers obtain maximum production.

The typical farmer in the less developed, food-deficient countries operates under quite different circumstances from those of his American counterpart. He lacks the capital to buy adequate amounts of important inputs such as fertilizers and plant protection chemicals even if they are available on the market. A new technology for him must take these and other constraints into account. He needs new high-yielding varieties that are efficient in making use of low levels of soil nutrients and that have built into the plant high levels of tolerance to important insect pests and diseases. Because he has a basically simple diet with a high level of cereal consumption, the high-yielding varieties of corn, sorghum, or wheat that have higher levels and improved quality of protein can have a great impact on his nutrition.

Research Tailored to Needs

The frequently mentioned Green Revolution is an example of the impact on developing country agriculture of research done in those countries and specifically for their needs. While the Green Revolution has not yet met the expectations of many, its actual contributions are substantial. For the agricultural year 1972/73, it is estimated that the "miracle" wheats and rices contributed about 16.4 million tons extra of foodgrain with a value of more than a billion dollars. That is enough food to feed some 110 million persons in the rice and wheat consuming areas of the developing world for a year.

While this is perhaps the most spectacular result of international agricultural research, it is only the tip of an iceberg. There is a rapidly growing global mobilization of effort to meet the agricultural research needs of the hungry nations. This international effort is supported by a growing body of data which shows that the return is high on investments in good agricultural research. It is an effective tool which enables the more technologically-advanced countries to join with the lesser developed countries to increase their food production.

Given the resources and expertise of the more technologically-advanced countries on the one hand, and the urgent need for increased production of food in the developing countries on the other, a serious effort is being made to develop international research networks in agriculture. Basically, these networks consist of three groups of institutions: research institutions in the developing countries; corresponding institutions in the more highly developed countries; and the relatively new international centers.

The international sorghum research network, for example, deals with one of the important foodgrains of the hungry nations which is particularly significant in areas where rainfall is too uncertain for crops such as corn and rice. Many developing countries participate in this international network and the regions they represent include the large semi-arid areas of South Asia and the Sahel of Africa. Brazil also is involved

Improving the protein quality and quantity of sorghum and oth grains is important to efforts aimed at upgrading nutrition.

through its large semi-arid Northeast region. T more highly developed country institutions at th stage are largely those of the United States. In partic ular, four land grant institutions have specific AI supported research projects in international researc on sorghum. These are Purdue University (improv nutritive quality of the grain), the University of N braska (drought tolerance and other physiologic pro lems), Texas A&M University (insect pest and di ease control), and the University of Puerto Ri (tropical breeding). The third element in the n work, international centers, is represented by the I ternational Crops Research Institute for the Sem Arid Tropics (ICRISAT), which is located in H derabad, India. Sorghum is one of the crops chosen f a major international research thrust at ICRISA These three sets of institutions constitute the fram work for a truly international effort on research d rected toward increased production of this basic foo grain in many developing countries.

Substantial U.S. Role

The role of the United States in supporting intern tional agricultural research is substantial. This is it should be. We have led the world in applyi science to the problems of agriculture, and in doi so have developed an unmatched set of federal an state agricultural research and development instit tions. We are in a dominant position to help th hungry nations produce the food they need.

During Fiscal Year 1976 AID is proposing an expen iture of approximately $50 million in support of inte national food and nutrition research. In terms of su port to U.S. institutions to work on the research nee of developing countries, the present level is around

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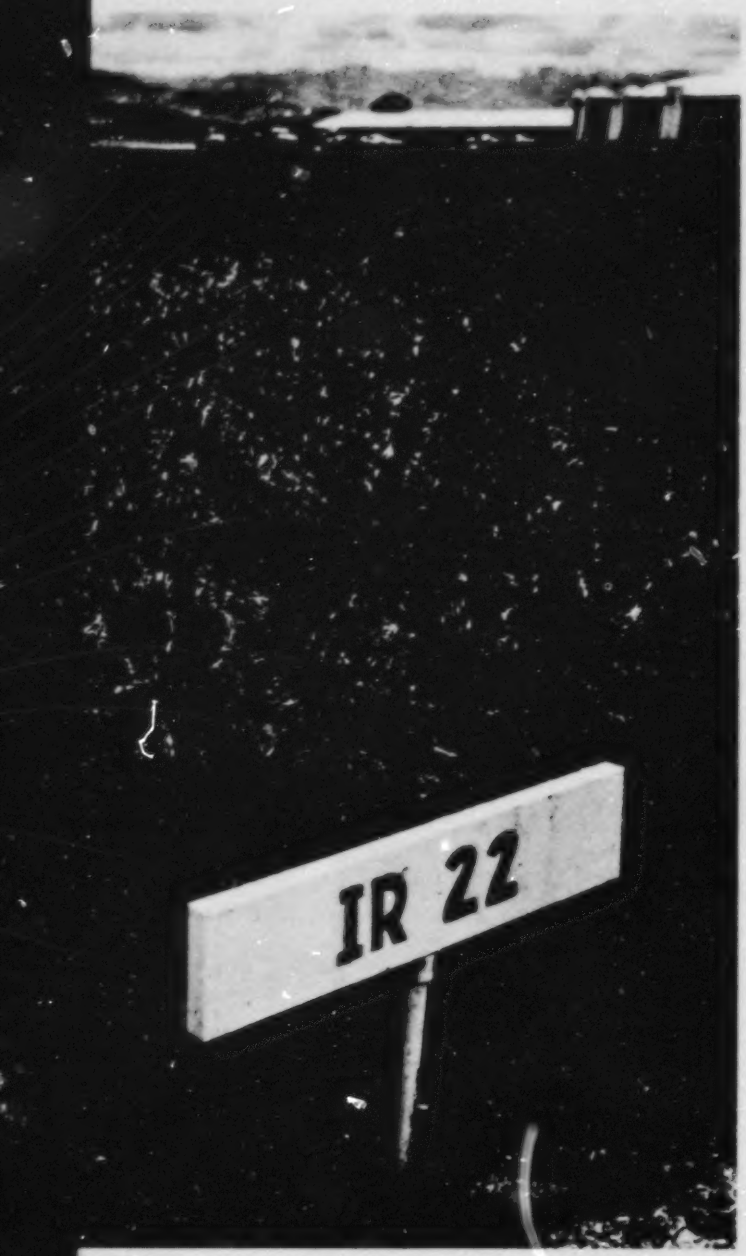
from Potentia

By Dana



Increasing food production through high yielding varieties of grains is a goal of international agricultural research . . .

Dr. Dalrymple is an agricultural economist with the U.S. Department of Agriculture on detail to AID. This article is adapted from the opening chapters of his bulletin on Measuring the Green Revolution: The Impact of Research on Wheat and Rice Production *(USDA, FAER No. 106, July 1975). The report reviews the main considerations in evaluating the effects of the international research program on crop production in developing nations and then demonstrates the use of several statistical techniques. The latter are not included in this article. The bulletin is available from the AID/USDA Technical Information Center, Foreign Development Division, Economic Research Service, USDA, Washington, D.C. 20250.*

Research on food crops in or for the less developed countries is relatively new. For decades, much of the agricultural research in these countries focused on plantation or export crops. Food crops for domestic consumption were, with a few exceptions, largely ignored. The situation began to change in the years following World War II, but even then, national research on food crops was usually given low priority and limited funding.

There were some exceptions. Perhaps the best known exception is the cooperative program on food crops begun by the Rockefeller Foundation and the Mexican Government in 1943. This work led to new research programs in other Latin American countries in the 1950s. Some other international cooperative research activities were carried out in the same decade and a few developed nations supported scattered institutional development and research programs in the less developed countries. But most of the research on food crops continued to be done in the developed nations.

A significant change took place in the early 1960s with the establishment of two international crop research institutes: The International Rice Research Institute (IRRI) in the Philippines and the International Maize and Wheat Improvement Center (CIMMYT) in Mexico. These two institutes were located in developing countries and oriented to their food problems. Their early successes led to the establishment of a number of other international research activities. They also led to a rebirth of interest in improving and expanding national research programs.

As of the mid-1970s research on food crops in and for the developing countries is finally coming of age. A Consultative Group on International Agricultural Research (CGIAR)—composed of nations, international organizations, and foundations—has been established. The annual investment on international research through this group reached about $47 million in 1975. The U.S. Agency for International Development contributes up to 25 percent of the costs of CGIAR-sponsored activities and is actively stepping up financial support for national research programs within less developed countries.

While the funds involved are substantially greater than those of a few years ago, they are miniscule in terms of the job to be done. They are also relatively small in terms of global expenditures for agricultural research in the developed nations or for other items of public expenditure. But they do represent a signifi-

. . . to Reality

Dalrymple

cant addition to the total expenditure on agricultural research for developing nations.

The quantitative effect of the international research institutes' efforts on actual production in the developing countries has not yet been closely examined. There are good reasons for this lag: the centers are new, such an analysis is very difficult, and few resources have been devoted to the task. Nevertheless, the field is not entirely unexplored. Some studies have been carried out in the past on the effect of national agricultural research programs, in both developed and less developed countries. Generally, the results have shown high rates of return to investment in research.

But it is a long way from the test plots of an international agricultural research institute to the farmer's field. Relating the activities of the institute to actual changes in crop production requires an understanding of (1) the potential effects of research and (2) the reasons for the gap between potential and reality. To judge the results of international research in terms of the farmers' yields is to judge many other aspects of the rural economy as well. It is a severe test.

The major product of the international institutes is new technology. New technology, in turn, brings about changes in the production process for the commodity involved. In terms of direct quantitative effects: (1) output is expanded at the same overall cost, or (2) the same output is produced at lower cost, or (3) some combination of these two results. Direct effects may also be accompanied by indirect effects.

The high-yielding varieties (HYVs) of wheat and rice are best known for their effect on the quantity of output. In addition, they may also influence the quality of the product.

Quantitative effect. HYVs usually bring about increased output per unit of land. While yields are increased, so are total costs per unit of land, because a package of associated inputs is needed. However, if HYVs are properly sited and used, returns per unit of product are usually increased. This increased profitability is, of course, largely responsible for their widespread adoption.

In the late 1960s, multiples of two or three times the traditional yield were claimed for the HYVs. These were largely measures of potential taken from experiment station trials or supervised demonstration plots. In itself, this increased potential could be considered one possible measure of the fruits of international research. Actual farm yields, however, have been lower.

. . . but substantial progress in developing countries will require national programs that help farmers utilize research results.

The yield effect has taken two different patterns in the breeding programs for wheat and rice. Semi-dwarf wheat varieties were not the first stage in the Mexican wheat breeding program; they came as a second stage and began to be released in the early 1960s. By contrast, the semi-dwarf characteristics were part of the IRRI rice breeding program from the outset. As a result, the yield potential of the newer Mexican wheat varieties, which incorporate the dwarfing characteristic, is greater than for the earlier improved varieties. By contrast, the maximum yield potential of the IRRI varieties has not increased greatly since the introduction of IR-8, an early high-yielding rice variety.

These different patterns were in part related to disease problems. Rust (a mold-like fungus) was the major problem for wheat. Development of resistant varieties was considered the only answer, and Dr. Norman Borlaug took up this work in 1945. By 1949, four new varieties were developed which were soon widely planted. A continuous battle is needed, however, as new strains of rust persistently appear. In 1974, CIMMYT reported that while the wheat varieties which moved out of Mexico in the 1960s showed good resistance, "resistance to some of the rusts is now breaking down. New varieties with different genetic resistance are urgently needed. It appears that 10 years may be the longest period that a variety can withstand the constantly changing attack of the three rusts."

Disease was not such an important factor in the early IRRI activities, but it soon became a serious concern. Other factors receiving major attention include insect resistance and tolerance to stress factors such as drought, cold, deep water, and soil problems.

Emphasis on Yield Stability

In addition to looking for increased yield potential, the institutes are placing considerable emphasis on achieving yield stability. Resistance to insects and disease, as well as tolerance to stress factors, play a major role in reducing year-to-year fluctuations in production.

Some of these research efforts will produce higher average farm yields, and other research will be needed just to maintain higher yields in the face of ever-changing insect and disease attacks.

Qualitative effects. The new varieties differ qualitatively from traditional varieties in two main ways: consumer acceptance and nutrient composition. Some of the early institute wheat and rice varieties achieved only limited acceptance in certain areas because of color, appearance, or taste differences. The result was a lower price. Most of these problems have been solved, or at least taken into account, in subsequent breeding programs, although traditional varieties still may be preferred in some places.

The question of relative nutrient quality is more difficult to assess. It depends on an involved interplay of genetic makeup, the quality and timing of nitrogen applications, and environmental factors. On balance there may not be much of a difference between the HYVs and the traditional varieties. Still, an attempt is being made to breed in higher protein levels and improved protein quality. This is particularly the case with rice. The challenge is to find varieties which have both higher yields and higher nutrient levels.

The indirect effects of the HYVs, like the direct effects, may have important quantitative and qualitative dimensions. Both are often overlooked.

One of the major biological features of the HYVs, especially rice, is a biological characteristic known as photoperiod insensitivity, which often shortens the time needed to reach maturity and provides greater flexibility in planting dates. This helps make it possible to grow an extra crop a year in some regions. Several rice-eating nations in southeast Asia have recently requested CIMMYT's help in introducing a wheat crop during the winter season. And Pakistan is studying the possibility of growing two crops of wheat a year. For these reasons, multiple cropping usually increases in Green Revolution areas, and in some cases where the HYVs were not superior to local varieties, they were adopted nevertheless because of their shorter growing period. Perhaps, in the long run, this indirect effect on output will be as important as or more important than the direct influence on yield.

A second indirect effect is that higher yields may free resources for other uses. This was recently reported to be the case in Uttar Pradesh in India: "The coming of the new technology has freed the small farmer from the less profitable cropping patterns on which he could always depend to provide minimum quantities of such staples as wheat and animal fodder for home consumption. If he grows high-yielding varieties, the small farmer can supply his home consumption needs and still have land remaining to grow high-yielding cereals for market or other high-profit crops like sugarcane." *

To take these and other effects into account, we should increasingly turn our attention from yields per crop to yields per unit of land per year. This will be particularly true as more work is devoted to developing improved farming systems.

The Gap

The high-yield technology developed at the research level represents only potential for yield improvements. The technology must be transformed into reality in actual farmers' fields in the less developed countries. Many factors outside the control of the experiment station intervene. Biological and economic constraints, as well as some traditional farming methods, can keep HYVs from being used optimally.

The new varieties are generally high yielding only if accompanied by a package of inputs. The most important factors are fertilizer and improved management, but water use and control of insects and diseases may also be vital. Of these, the international agricultural center provides only the seed and, in some cases, a set of recommendations. The other inputs have to be provided by the farmer at the local level. Many forces well beyond the farmers' control can affect the availability of some of these inputs, as has recently been vividly shown in the case of fertilizer.

Quite often, the variety provided by the institute is only raw material which needs to be more fully refined for local use by national research programs. In fact, the IRRI and CIMMYT varieties are not wholly new varieties; in most cases, they build on gen-

* Ian R. Wills, "Projections of Effects of Modern Inputs on Agricultural Income and Employment in a Community Development Block, Uttar Pradesh, India," *American Journal of Agricultural Economics*, August 1972, pp. 457-458.

Good crop yields in developing countries are often the result of research which involves attention to such factors as disease and insect resistance but improved farming practices, such as careful weeding, can be equally important.

erations of breeding efforts which have gone on before at the national and regional levels. For these reasons, the new wheats and rices should be viewed as joint products of national and international research efforts.

The HYV yield potential, determined on experiment stations, is often considerably higher than that obtained in practice. In the Philippines, for instance, the potential rice yield is in the neighborhood of eight metric tons per hectare, (mt/ha), whereas actual overall yields (traditional and HYV) are slightly less than two tons.

What accounts for such differences? First, the HYVs are not planted on all of the cropland. In Asia in 1972/73, the HYVs accounted for about 35 percent of the total wheat area and 20 percent of the total rice area. In a few nations the proportions were relatively high: for wheat the HYV proportion was 55.9 percent in Pakistan, and 51.5 percent in India; for rice the HYV proportion was 56.3 percent in the Philippines and 43.4 percent in Pakistan.

Second, even with local breeding efforts, there are biological limits on the proportion of crop area suitable for the HYVs. For instance, much of the wheat area in Turkey is suited only for winter wheats, whereas the Mexican HYVs are spring wheats. Within an area planted to HYVs, numerous other biological problems restrain output. A breakdown of the constraints reported in one small sample rice survey in the Philippines in 1972/73 suggests the variety of possible limitations that face the farmer.

	Season	
Limiting factor as a percentage of total	Wet	Dry
Insects and diseases	35	70
Water	26	–
Nitrogen	21	6
Weeds	9	18
Seedling	9	6
	100	100

Insects and diseases were not only the major limiting factor in the dry season but were twice as important in the wet season. Some other factors restraining adoption may be classified as (1) institutional/economic (farm size, lack of credit, uncertain

Fertilizer is an important factor in increasing crop yields, but rising costs for this input are discouraging its use.

tenure) and (2) risk/uncertainty (economic and agronomic).

But even allowing for these factors, HYV yields are often not as high as might be expected. Part of this is because many farmers do not follow the recommended practices or levels of input use. The same Philippine survey suggests the difference in rice yields due to farmers' practices:

	Yields	
Practices	Dry Season	Wet Season
	metric tons per hectare	
Recommended	7.3	5.0
Actual	3.9	3.3

Hence the gap between potential and reality may be partly reduced by greater use of improved practices. And some of the biological factors can be at least partly corrected in time through research programs by developing, for example, greater insect and disease resistance. But there are technical and economic limits as to how far this process will go: there will always be some gap between potential and reality. The challenge is to make the gap smaller.

The Research Link-Up, from p. 7

million; hopefully it can be increased to some $26 million by 1980. Substantial increases are also needed for developing country research institutions, and for the international centers.

But this research is only a means toward the end of increased availability of food to those that need it. The resulting technology will mean little unless the farmer makes use of it. Herein lies a basic challenge and problem for development.

The challenge may be seen in the growing body of relevant technology. For example, in an AID supported research project, the University of Nebraska has developed a new high-yielding variety of high protein wheat. If produced on all of Nebraska's wheat acres, it could contribute as much as 900 railroad boxcars of additional protein in a single year. The implications for human nutrition if this variety were widely grown in the developing countries are obvious. Correspondingly exciting research results are emerging in the new high-lysine varieties of corn and sorghum. The question is: How can we help to get the results in the hands of the farmers?

The problem of reaching the farmer is largely one of the concerned country. But the United States can do much to help. Beyond assuring that research is sharply focused on the farmers' needs, we also have the means of getting down to the farmer on a limited but significant scale. A number of U.S. universities working in developing countries are engaged in production programs and research. The research projects supported by AID, in U.S. universities and in international research centers, are looking critically at the technology needs of the poor farmer.

U.S. agricultural assistance programs in developing countries emphasize approaches that will couple the potential of a relevant modern technology to the problems and opportunities of agriculture in the developing world. Attention is directed to research that recognizes and more effectively utilizes underemployed manpower for a more productive agriculture. Support also is channelled into projects that will increase the availability of critical agricultural inputs, such as a dependable supply of high-quality seeds and appropriate fertilizers. In addition, rural development programs assisted by AID seek better economic incentives for the small farmer and encourage institutional improvements that will benefit him, as in the case of improved distribution and marketing systems.

At the World Food Conference in 1974, Secretary of State Henry Kissinger declared that the United States would continue and increase its aid to the developing countries in their struggle to expand food production. That assistance, extended primarily through AID, will be especially effective if the benefits of modern agricultural research can be utilized by the millions of small farmers in the less developed countries who now must share a larger part of the burden for balancing the world's supply of food with the demands of a growing population.

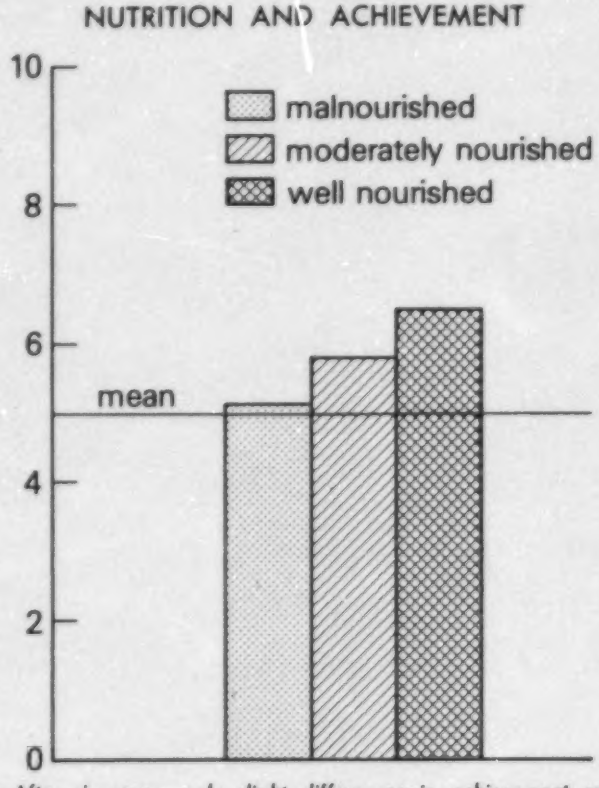
NEW HOPE IN THE BATTLE AGAINST MALNUTRITION

A recently completed medical study of a group of Korean orphans adopted in the United States during the 1960s has shown that severely malnourished children can reach or exceed accepted normal values for height, weight, intelligence, and achievement when reared in an adoptive environment in U.S. homes. The conditions of the orphans ranged from severely malnourished to well nourished at the time of their admission to the adoption program. All were under three years of age when they were adopted by American families.

The study, partially financed through a $32,000 research grant from the Agency for International Development in July 1972, focused on a group of 141 Korean orphans for whom complete records were available from the time of their admission to the adoption program. Data for the children's medical, academic, and family histories within the United States covering a minimum of six years was studied by a medical research group which included Dr. Myron Winick, Professor of Nutrition and Director of the Institute of Human Nutrition at the Columbia University College of Physicians and Surgeons in New York, Dr. Ruth C. Harris, also of Columbia University, and Dr. Knarig K. Meyer of the Department of Health, Physical Education and Recreation of the City University of New York.

Announcing the study's findings at an international conference held February 27, 1975, in New York City by the Association for Children with Learning Disabilities, Dr. Winick pointed out that previous research has indicated that malnutrition during the first year of life, coupled with continued poor socio-economic conditions, results in retarded brain growth and mental development which persists into adult life. However, the study of the Korean orphans had examined the outcome of children who were adopted during early life by U.S. parents and had thereby undergone a total change in their environment. "The results are in striking contrast to those obtained from similar groups of children returned to the environments from which they came," Dr. Winick said. "Even the severely malnourished Korean child has surpassed in height and weight what non-malnourished Korean children achieve."

On the basis of the initial medical data on the orphans at the time of their admission to the adoption program, the researchers considered the children under three categories—severely malnourished, moderately malnourished, and well nourished. Current case histories for the children, compiled over a period of at least six years with the adoptive parents' permission, shows that the children in all three groups have attained I.Q. scores that equal or exceed scores which are normal by U.S. standards. In addition, achievement in school for the severely malnourished group



After six years, only slight differences in achievement scores were noted between the three groups of children in the study.

was shown to be "exactly as would be expected for a normal middle class U.S. population," Dr. Winick noted. However, the well nourished children reached I.Q. and achievement levels which exceeded those of the malnourished children and "normal" U.S. children.

Physical Growth Studied

Comparisons also were made of current height and weight data for the children in each group and to expected values for both Korean and American norms. All three groups surpassed the expected mean for Korean children for both height and weight. Although the children are heavier and taller than would be expected if they had remained in Korea, none of the groups attained mean values for normal American children of the same age. A significant finding of the study, he pointed out, was that "the marked initial difference between the malnourished and well nourished infants have almost entirely disappeared, leaving only a small difference in the final height achieved."

Dr. Irwin Hornstein, Deputy Director of AID's Office of Nutrition, explained that AID's interest in the study was to gain new information on the rehabilitative possibilities for severely malnourished children. "The relationship between mental and physical development as these are affected by malnourishment is still not fully understood," he noted, "and a great deal of work has been done to try to 'tease out' the nutritional factor from the stimulative factor. We have seen from previous studies that children malnourished during the first two years of life generally show signs of persistent retardation in mental and physical development. This has been the case even when they have been successfully rehabilitated in a nutritional sense but then returned to their original home environment, which is usually characterized by poor socio-economic conditions.

Need to Know More

"What this study of the orphans adopted in the United States sought to determine was what happens when you put the malnourished child into a good environment over an extended period of time," Dr. Hornstein emphasized. "But the findings of this study," he added, "while very encouraging, must still be considered quite limited in their applicability. All of the children came under the care of the adoption agency before they were two years old and all were adopted into American families under the age of three. We still do not know what the persistent effects of malnutrition are for children who are malnourished for a longer time, say up to age four or five, and then introduced to a positive nutritional and stimulative environment. AID is presently planning to finance further studies that hopefully will give us more information on this very important question."

Population, from p. 5

ning programs today in those nations of Asia, like India, Pakistan, and Bangladesh where the problem is greatest, is, and remains, the inability to reach rural areas with adequate services or supplies. Despite a proliferation of posters and publicity in capital cities, the average rural peasant woman in South Asia still has no one to go to within her village on a regular trusted basis for good, safe, up-to-date advice on pregnancy, family planning, infant care, and nutrition, and the necessary supplies to put the advice into practice.

The developing countries are, indeed, beginning to recognize the problem of inadequate delivery systems and are initiating measures to overcome the difficulties.

- In Pakistan, a survey in 1969, four years after the national program was established, revealed that only 15 percent of the population could name an individual or location where family planning services were available. Pakistan has recently initiated an inundation program whereby pills and condoms are being made widely available commercially in small shops throughout the country.
- The contraceptive program in Thailand, which was initiated in 1969, was moving along relatively slowly as long as pill distribution was restricted to physicians who operated 300 government clinics. In mid-1970 the government permitted auxiliary midwives to dispense oral contraceptives. This effectively increased the number of distribution points tenfold with a corresponding increase in the number of contraceptive acceptors within a two-year period.
- Indonesia, which has permitted nonprescription distribution of oral contraceptives since their program began in 1970, has had a rapidly expanding program, recruiting 1.5 million new acceptors in 1974. It is estimated that currently over 2 million couples, or about 15 percent of the eligible population, are using contraceptives—a dramatic accomplishment in less than five years.

Even in countries like Taiwan which is considered to have a highly successful program, Johns Hopkins has undertaken a project involving the house-to-house distribution of oral contraceptives and pills in the rural areas. We found among 20,000 women in 12 townships about 8,000 were not using contraceptives. Of this group more than 4,000 accepted the pills or condoms provided by the distribution program.

AID programs, over the last decade, have performed excellently in providing adequate supplies, information, and expert technical help to government and the capital cities in many less developed countries. Urban programs, demonstration projects, and planning for rural coverage is well underway, with varying degrees of government support, in over 60 countries now, but the task of seeing that contraceptives, trained personnel, and continuing education and services actually reach the vast rural populations of these countries will require a further thrust and probably some additional resources from the top levels of government in each country.

IN PRINT

Can Agriculture Set the Pace?

A Review by James M. Blume

Reaping the Green Revolution—Food and Jobs for All by Sudhir Sen. Orbis Books, Maryknoll, New York, 1975. 397 pp., $10.95.

This volume complements Sudhir Sen's last book, entitled *A Richer Harvest—New Horizons for Developing Countries*, which was reviewed in the September issue of this magazine. Together, the two volumes constitute the second part of a planned trilogy on international development, which would deal, respectively, with the roles of the three parties involved in development: the donors, the receivers, and the administrators of aid. These two volumes, concerned with the role of aid receivers, focus almost exclusively on India, the author's home country.

Dr. Sen's thesis is that the Green Revolution provides a means to get agriculture moving and that a modernizing agriculture, in turn, can provide the resources and the pattern for development of the overall economy.

A substantial portion of the book is devoted to the need for slowing down population growth but Dr. Sen sees little hope for progress in this direction until there is some improvement in the economic and social condition of the people. He believes unemployment is India's biggest problem. Writing of the educated unemployed, he says:

"A farm sector operated with increasing intensity, a fast-expanding non-farm sector starting with farm-related facilities and services, but soon radiating in other directions, especially toward consumer goods and various service industries, and a vigorous comprehensive, public works programme, again with its primary emphasis on rural areas, will directly create tens of millions of jobs for the educated and indirectly a great many more."

Dr. Sen argues for a large program of rural roads to link the villages to the market towns and for improving the market towns themselves by provision of additional and improved warehousing, rice mills, cold storage plants, and the like. He would have private industry handle much of this but also sees an important role for government. He says that the most important public sector industry in India today could be the building of infrastructure (e.g., power, roads, water supply, sewerage) for market town development. He sees little need for elaborate studies on location of market towns but would start with the distribution pattern which has already developed, noting that there are in existence market towns and country bazaars, and some villages which are much larger than others. It is likely that economic causes have contributed to this differentiation. He thinks the costs of such a public works program would not be great and that, for the most part, it could be financed without outside help. He writes:

"What is really needed is a spatial pooling of authorized programs and facilities now scattered helter-skelter over the vast expanse of rural India."

Dr. Sen argues strongly for a stringent program of land reform. He insists on ownership by the cultivator, believing security of tenancy laws too difficult to enforce. He advocates a ceiling of 10 acres on all holdings (with rare exceptions) without distinction based on water supply or soil fertility. A fixed ceiling unrelated to productive capacity would seem to be poor economics. Before accepting the wisdom of a uniform ceiling, this observer would like some evidence that Indian governmental agencies would enforce such a provision more equitably than the land laws now in existence.

The author's conclusions warrant consideration even though his book contains some factual errors and statements of doubtful precision. For example, toning milk, as it is practiced in India, reduces the fat rather than the protein content. Doubling the consumption of fish and halving the consumption of rice in West Bengal would worsen the diet in terms of both calories and protein, rather than improve it. India is not the only country which produces shade-grown coffee. And, there is some doubt that it is entirely accurate to say that small farms in India are inherently more productive than large ones when the definition of large farms appears to include everything over 30 acres and perhaps even those over 10.

The Indian farmer—key to his country's economic development?

Dr. Blume retired from AID in 1973 after more than 20 years service in U.S. foreign assistance programs, including an agricultural research assignment in India during the early 1950s.

IN BRIEF

Penny Foundation Founder Dies

Sam Greene, who assisted thousands of victims of poverty in Guatemala and throughout Central and South America, died on October 7 at the Mount Sinai Hospital in New York. He was 83.

Mr. Greene was the founder of the Penny Foundation in Guatemala (see *War on Hunger*, January 1973) which made it possible for the poor to repay loans at the cost of a few pennies a day. He showed the rural population in the Central America country how they could obtain credit by pooling small individual earnings to gain credit for obtaining potable water, electricity, or tractors. The Agency for International Development and the Pan American Development Foundation provided loan and grant assistance to the Penny Foundation.

Expressions of sympathy may be in the form of contributions to the Penny Foundation, c/o Pan American Development Foundation, 1725 K Street, N.W., Suite 1409, Washington, D. C. 20006.

Loans for Rural Development

AID is funding two rural development projects in Liberia that will assist small farmers by establishing a farmer credit and cooperative system and by improving or constructing approximately 400 miles of rural roads.

Grants to Aid Women

The Agency for International Development has awarded grants to two major women's organizations—the National Council of Negro Women (NCNW) and the Overseas Education Fund of the League of Women Voters (OEF).

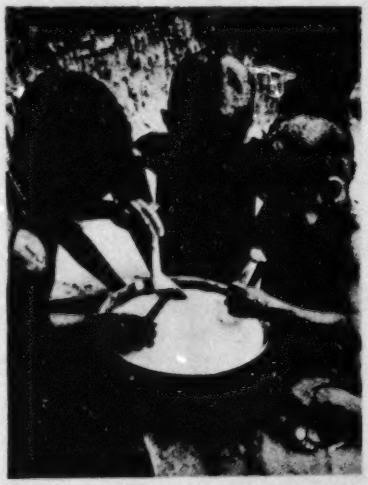
The NCNW will receive a $825,000 Development Program Grant over a three-year period to improve the planning, implementation, and evaluation capability of that organization to develop a coordinated international program.

A similar grant to the OEF of $850,000 for three years will enable OEF to acquire needed expertise to plan, develop, and evaluate an expanded cross-cultural program directed to needy women in the less developed countries.

Report on Voluntary Agencies

The annual report on "Voluntary Foreign Aid Programs" issued by AID is now available to the public. The report covers 94 American voluntary agencies engaged in overseas relief and development, which are registered with AID's Advisory Committee on Voluntary Foreign Aid.

The annual report, which lists the addresses of the registered agencies and provides a brief description of their activities, may be obtained free of charge by writing to: Office of Private and Voluntary Cooperation, PHA, Agency for International Development, Washington, D.C. 20523.



"We must proclaim a bold objective—that within a decade
No Child Will Go to Bed Hungry"

AID Poster Available

A limited number of copies of this poster are available from AID. Persons or organizations wishing to obtain one should write the Publications Division, Office of Public Affairs, Agency for International Development, Washington, D. C. 20523.

QUOTES

"The poor nations are not criticizing the rich nations because they are rich and because three-quarters of the world's income, investment, and services, and most of the world's research, are in the hands of one-quarter of its population. Nor are the poor nationals asking for a massive redistribution of existing income and wealth.

"What they are really arguing for is a greater equality of opportunity in the future, which is impossible to achieve within the present economic imbalances and the existing world structures which favor the rich nations."

Mahbub ul Haq
World Bank
The Christian Science Monitor
August 29, 1975

"In the long run, the solution to the world food problem will not come from American charity or guilt, or even from America's incredible agricultural productivity. It will come when nations develop the capacity to meet a substantial part of their own food needs, and this means rural development. . . ."

Andrew Greeley
Chicago Tribune
August 5, 1975

"To be sure, we need to bargain hard and indicate the unreal nature of some demands made by developing countries, including many in the Declaration of Rights and Duties adopted over U.S. opposition by the UN General Assembly last year. But in our own long-range interests in a workable global economy, we must also take a positive approach, one that accepts and understands new economic realities and provides a constructive view of the future."

Senator Edward M. Kennedy
(D-Massachusetts)
The Washington Post
September 2, 1975

War on Hunger

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